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EVALUATION OF SOUTHERN PINE BEETLE INFESTATIONS ON THE NATIONAL FORESTS IN ALABAMA

by

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ABSTRACT

Aerial surveys and ground checks of 394,211 acres of susceptible host type were performed during July and August. The districts evaluated included the Bankhead with 1.46 spots/1000 acres, the Black Warrior with .36 spots/1000 acres, the Oakmulgee with .06 spots/1000 acres, the Shoal Creek with .32 spots/1000 acres, the Talladega with .02 spots/1000 acres and the Tuskegee with 2.8 spots/1000 acres. Based on the current infestations and the predicted additional losses, Forest Pest Management recommends that the southern pine beetle suppression projects be discontinued.

INTRODUCTION

Biological evaluations of southern pine beetle infestations were conducted on the Bankhead, Talladega, and Tuskegee National Forests. The districts were evaluated according to the following calendar.

Talladega	
Shoal Creek	July 7-10, 1980
Talladega	July 7-10, 1980
Oakmulgee	July 28-31, 1980
Tuskegee	July 28-31, 1980
Bankhead	August 4-7, 1980
Bankhead	
Black Warrior	

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These evaluations were performed to determine the current pest status of the southern pine beetle (Dendroctonus frontalis, Zimm.) within each district. Based upon these evaluations recommendations for FY 81 are suggested along with possible prevention and suppression alternatives.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATIONS

Aerial Survey

Aerial surveys for all the districts covered in the evaluations were performed by district staff. Flights of 100% coverage were made at 2-4 week intervals. Southern pine beetle spots were plotted on Forest Service class A district maps, and an effort was made to estimate the number of red and/or fading trees visible from the air.

Ground Procedures

Based upon the latest flight data, spots were classified according to size. Ten percent of the total spots, or a minimum of 10 spots, were selected proportionate to the spot size class distribution (1-25, 26-50, 51-100, >100). The designated spots were visited, and numbers of vacated and infested trees, basal area, age, height, and percentage of the stand in sawtimber were recorded.

Decision Criteria

Decisions to continue or discontinue a SPB suppression project were based on the following criteria:

- Number of SPB spots/1000 acres of host type

  This figure provides an indication of current levels of SPB activity. Historically, one multiple tree SPB spot/1000 acres of host type has been considered the lower threshold of an epidemic outbreak. However, one or more multiple tree spots/1000 acres of host type does not always require that SPB suppression be undertaken. This is the case when the majority of the spots are small involving minimal timber losses, and individual spots are likely to become inactive.

- Green tree:red tree ratios

  These ratios give an indication of SPB activity at the time of ground check, but are of limited value in predicting future losses.

- Additional timber losses in each spot for the 30 day period following ground check.

  This quantity is calculated by using a formula developed by the

Texas Forest Service (Billings and Hymun 1980). The number of spots showing additional timber loss was used to determine the potential losses under current conditions. A large number of spots on a district become relatively unimportant if they will not involve additional timber losses. In addition a formula developed by Hedden and Reed gives the probability of a spot going inactive.

- Volume currently infested

  This figure is used to calculate the volumes threatened. The volume of timber threatened increases more rapidly than does the volume currently infested, thus as the volume currently infested increases the economic benefits from a SPB suppression project increases more rapidly.

- Entomological judgement

  Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

BANKHEAD NF

Bankhead RD

A total of 74 spots were recorded from the aerial survey. Twenty-five percent of the spots ground checked were determined to be inactive, therefore, all subsequent analyses were based on 55 active spots. Ground checked spots ranged in size from 3-117 with a mean of 35 trees. Within these spots, a mean of 36% of the trees were found to be active. Table 1 summarizes the data collected. A total of 37,764 acres of host type exists on the district with an average of 1.46 spots per 1000 acres (host type). Currently within these active spots 50.06 MBF of timber is infested.

Predictions of additional trees killed 30 days after ground check indicate that 3 of the 9 spots should involve additional losses (Billings & Hynum 1980). A regional nonlinear rate of growth model, which has shown adequate precision in limited areas across the south, indicates that the predicted cumulative growth rate of the 55 spots throughout the district is .27 additional trees killed per day(Hedden & Reed). These statistics are summarized in Tables 2 & 3. Based on these predictions, 30% of the spots (largest spots w/high basal area) will remain active but will result in little additional mortality.

TABLE 1. Summary of Southern Pine Beetle Ground Check Data for the Bankhead Ranger District, August 4-7, 1980

SPOT NO.	VACATED TREES RED	VACATED TREES TOTAL	INFESTED TREES RED	INFESTED TREES GREEN	INFESTED TREES TOTAL	TOTAL TREES VAC. & INF.	% INF.	GREEN:RED	BASAL AREA PINE/HWD.	DBH:HT.	AGE
1.	5	5	0	6	6	11	55	1.20:1	150/10	7:45	47
2.	45	45	0	2	2	47	4	1.22:5	90/50	Pulp	12
3.	40	44	10	5	15	59	25	1:10	70/50	13:65	60
4.	42	42	6	10	16	58	28	1:4.8	130/40	6:24	15
5.	2	2	0	1	1	3	33	1:2	40/70	7:35	45
6.	7	7	0	6	6	13	46	1:1.17	130/20	9:45	39
7.	1	1	0	2	2	3	67	2:1	130/20	7:30	30
8.	7	7	0	1	1	8	13	1:7	110/10	12:-	41
9.	59	59	4	54	58	117	50	1:1.17	100/60	7:30	12
TOTAL	208	212	20	87	107	319	321	10.20:50.64	950/330	68:274	301
MEAN	23	24	2	10	12	35	36	1:4.98	106/37	8.5:39	33

TABLE 2. Additional Timber Losses to be Expected from Spot Growth over 30 Days During Summer on the Bankhead Ranger District

SPOT #	INFESTED TREES	BASAL AREA	PROBABILITY OF INACTIVITY(P)[2/]	PREDICTED ADDITIONAL TREES KILLED[3/]
1	6	160	.68	0
2	2	140	.73	0
3	15	120	.53	4.17
4	16	170	.51	9.85
5	1	110	.75	0
6	6	150	.68	0
7	2	150	.73	0
8	1	120	.75	0
9	58	160	.05	49.60

2/ $P=1/[1+ \exp(-1.144 + 0.069\ AT)]$; P= Probability of a spot going inactive after 30 days; AT= Initial number of active trees; Hedden, R.L. and D.D. Reed, unpublished.

3/ ATK= [(0.000202 IAT x TBA) - 0.2211] x 30; ATK= Number of additional trees killed by day 30; IAT= Number of actives trees at day 0; TBA= Total basal area in Ft^2/acre; Billings, R.F. and B.G. Hynum, 1980. Southern Pine Beetle Guide for Predicting Timber Losses From Expanding Spots in East Texas, Circular 249. Texas Forest Service.

TABLE 3. Regional Nonlinear Rate of Growth Model[4/]

AT	DBH (cm)	TBA (M^2/ha)	POP (Spots/1000ha)	TK
12	21.59	31.79	3.60	.27

4/ $\ln (TK) = 3.43457 + 0.96545 \ln (AT) - 2.84669 \ln (DBH) - 22.13668 (TBA/DBH^2) + 0.073662 (TBA) + 0.22567 (POP)$

TK = Additional trees killed per day
AT = Initial number of active trees at the first visit
TBA= Total basal area at spot origin (M^2/ha)
DBH= Mean DBH of the stand (cm)
POP= Number of spots per 1000 ha of host type

Hedden, R.L. and D.D. Reed, unpublished

Black Warrior RD

A total of 19 new spots (50% in special classification areas, i.e., RARE II, wilderness, etc.) were recorded from the aerial survey flown on August 6, 1980. In addition 9 spots that had been recorded from previous flights were still active. Spots ground checked ranged in size from 7-117 trees with a mean of 38 trees. Within these spots, a mean of 33% of the trees were found to be active. Currently 31.8 MBF of timber are infested in managed stands. Table 4 summarizes the data collected. A total of 80,415 acres of host type exists on the district with an average of .35 spots per 1000 acres (host type).

Predictions of additional trees killed 30 days after ground check indicted that 3 of the 12 spots could involve additional losses. A regional nonlinear rate of growth model indicates that the predicted cumulative growth rate of the 28 spots throughout the district involves .08 additional trees killed per day. These 2 predictive tools indicate that the spot growth trend of the current summer infestations, while showing potential for additional losses in the very largest spots, should continue at a negligible rate of growth. Tables 5 & 6 summarize the spot growth analyses.

TALLADEGA NF

Oakmulgee RD

A total of 8 active spots exists on the district. Spots ranged in size from 36-93 trees with a mean of 56 trees. Within these spots a mean of 32% of the trees were found to be active. Table 7 summarizes the data collected. A total of 129,261 acres of host type exists on the district with an average of .06 active spots per 1000 acres (host type). Currently within these active spots 23.52 MBF of timber is infested.

Predictions of additional trees killed 30 days after ground check indicate that 5 of the 8 spots could involve additional losses. A regional nonlinear rate of growth model indicates that the predicted cumulative growth rate of the 8 active spots throughout the district involves .16 additional trees killed per day. Tables 8 & 9 summarize these analyses. The spot growth trend of the current summer infestations while showing potential for additional losses in the very largest spots, predicts very low cumulative timber losses for the district (.16 additional trees killed per day).

Shoal Creek RD

A total of 24 new spots were recorded from the aerial survey flown on July 2, 1980. Spots ground checked containing merchantable timber ranged

TABLE 4. Summary of Southern Pine Beetle Ground Check Data for the Black Warrior Ranger District, August 4-7, 1980

SPOT NO.	VACATED TREES RED	VACATED TREES TOTAL	INFESTED TREES RED	INFESTED TREES GREEN	INFESTED TREES TOTAL	TOTAL TREES VAC. & INF.	% INF	GREEN:RED	BASAL AREA PINE/HWD.	DBH:HT	AGE
1.	3	16	1	9	10	26	38	2.25:1	120/0	9.5:54	40
2	15	85	2	22	24	109	22	1.29:1	90/40	11:64	38
3	2	6	0	1	1	7	14	1:2	60/40	12:60	51
4	2	16	0	1	1	17	6	1:2	120/0	12:64	58
5	7	12	0	3	3	15	20	1:2.33	110/20	8.0:70	49
6	1	7	0	7	7	14	50	7:1	110/40	13:79	52
7	3	113	1	3	4	117	3	1:1.33	95/50	10:54	53
8	14	31	9	19	28	59	47	1:1.21	90/60	10:66	71
9	0	40	0	2	2	42	5	2:0	70/50	9.0:72	70
10	2	34	0	2	2	36	6	1:1	70/20	10.5:63	55
11	0	0	1	4	5	5	100	4:1	130/0	11.5:52	50
12	2	2	1	7	8	10	80	3.50:1	110/20	13:64	65
TOTAL											
With Special Classifications Stands	51	362	15	80	95	457	33	26.04:14.87	1175/340	129.5:762	652
Without Special Classifications Stands	41	327	15	69	84	41	26	17.04:9.54	835/280	96.5:549	493
MEAN											
With Special Classification Stands	4.25	30.17	1.25	6.67	7.92	38.08	2.75	1.75:1	98/28	10.79:63.50	54
Without Special Classifications Stands	4.56	36.33	1.67	7.67	9.33	45.67	2.89	1.78:1	93/31	10.72:61.00	55

TABLE 5. Additional Timber Losses to be Expected from Spot Growth over 30 Days During Summer on the Black Warrior Ranger District

SPOT #	INFESTED TREES	BASAL AREA	PROBABILITY OF INACTIVITY (P)[2]	PREDICTED ADDITIONAL TREES KILLED[3]
1	10	120	.61	.64
2	24	130	.37	12.27
3	1	100	.75	0
4	1	120	.75	0
5	3	130	.72	0
6	7	150	.66	0
7	4	145	.70	0
8	28	150	.31	18.82
9	2	120	.73	0
10	2	90	.73	0
11	5	130	.69	0
12	8	130	.65	0

2/ Hedden, op. cit.

3/ Billings, op. cit.

TABLE 6. Regional Nonlinear Rate of Growth Model[4/]

AT	DBH (cm)	TBA (M^2/ha)	POP (Spots/1000ha)	TK
9.33	27.23	27.57	.89	.08

[4/] Hedden, op. cit.

TABLE 7. Summary of Southern Pine Beetle Ground Check Data for the Oakmulgee Ranger District, July 28-31, 1980

SPOT NO.	VACATED TREES RED	VACATED TREES TOTAL	INFESTED TREES RED	INFESTED TREES GREEN	INFESTED TREES TOTAL	TOTAL TREES	% INF.	GREEN:RED	BASAL AREA PINE/HWD.	DBH:HT	AGE
1	26	38	8	9	17	55	31	1:3.78	120/30	8.1:91	50
2	28	28	34	8	42	70	60	1:7.75	120/10	5.7:68	34
3	30	36	3	5	8	44	18	1:6.60	100/30	8.2:73	35
4	14	33	2	5	7	40	18	1:3.40	90/10	8.0:59	27
5	25	42	4	19	23	65	35	1:1.53	130/30	8.0:80	44
6	43	72	10	11	21	93	23	1:4.82	100/30	5.2:52	36
7	9	34	0	2	2	36	6	1:4.50	90/60	8.1:72	40
8	17	17	24	5	29	46	63	1:8.20	140/10	7.7:74	44
TOTAL	192	300	85	64	149	449	254	1:40.58	890/210	59.00:569.00	310
MEAN	24	37.50	10.63	8	18.63	56.13	31.75	1:5.07	111.25/26.25	7.38:71.13	39

TABLE 8. Additional Timber Losses to be Expected From Spot Growth over 30 Days During Summer on the Oakmulgee Ranger District

SPOT #	INFESTED TREES	BASAL AREA	PROBABILITY OF INACTIVITY(P)[2]	PREDICTED ADDITIONAL TREES KILLED[3]
1	17	150	.49	8.82
2	42	130	.15	26.45
3	8	130	.65	0
4	7	100	.66	0
5	23	160	.39	15.67
6	21	130	.42	9.91
7	2	150	.73	0
8	29	150	.30	19.73

[2] Hedden, op. cit.

[3] Billings, op. cit.

TABLE 9. Regional Nonlinear Rate of Growth Model[4/]

AT	DBH (cm)	TBA (M^2/ha)	POP (Spots 1000/ha)	TK
18.63	18.75	30.46	.15	.16

[1/] Heddon, op. cit.

in size from 8-108 trees with a mean of 44 trees. Within these spots a mean of 33% of the trees were found to be active.

One spot in a non-merchantable plantation (DBH-5") covered approximately 10 acres estimated to contain 6,810 trees. Six percent of these trees were found to be active. Table 10 summarizes the data collected. A total of 74,200 acres of host type exists on the district with an average of .32 active spots per 1000 acres (host type). Currently within these active spots 156.44 MBF of merchantable timber and 107.39 MBF of non-merchantable plantation are infested. Predictions of additional trees killed 30 days after ground check indicate that 7 of the 10 spots could involve additional losses. A regional nonlinear rate of growth model indicates that the predicted cumulative growth rate of the 24 active spots throughout the district involves .31 additional trees killed per day. Tables 11 & 12 summarize these analyses. According to the predicted losses the additional timber losses during the next 30 days could equal .50 of the initial active volume.

Talladega RD

Only 1 new active spot was recorded for the entire district. All of the spots recorded from previous flights had become inactive. This spot, in merchantable timber, contained 55 trees with approximately 47% of the trees active. A total of 63,989 acres of host type exists on the district with an average of .02 spots per 1000 acres (host type).

TUSKEGEE NF

A total of 36 new spots were recorded from the aerial survey flown on July 21, 1980. The ground check revealed that 33% of the spots were black turpentine beetle spots. Therefore the aerial spots were reduced by 33% resulting in 24 active southern pine beetle spots. A total of 8,532 acres of host type exist on the district with an average of 2.8 spots per 1000 acres (host type). Currently within these active spots 123.2 MBF of sawtimber is infested.

Predictions of additional trees killed 30 days after ground check indicate that 1 of the 5 spots could involve additional losses. A regional nonlinear rate of growth model indicates that the predicted cumulative growth rate of the 36 active spots throughout the district involves .28 additional trees killed per day. Tables 14 & 15 summarize these analyses. According to representative spots ground checked, the volumes predicted as additional losses are contained in 20% of the spots.

TABLE 10. Summary of Southern Pine Beetle Ground Check Data for the Shoal Creek Ranger District, July 7-10, 1980

SPOT NO.	VACATED TREES RED	VACATED TREES TOTAL	INFESTED TREES RED	INFESTED TREES GREEN	INFESTED TREES TOTAL	TOTAL TREES	% INF.	GREEN:RED	BASAL AREA PINE/HWD.	DBH:HT	AGE
1	4	-	2	2	4	8	50	1:3	60/10	13:85	45
2	6	-	3	0	3	9	33	-	40/0	10.7:54	20
3	6	-	4	2	6	12	50	1:5	70/10	15.5:67	65
4	-	3840	44	196	240	4080	6	4.5:1	80/0	5:25	12
5	19	-	18	64	82	101	81	1.7:1	95/50	14:80	40
6	-	10	16	16	32	42	76	1:1	70/40	14:90	55
7	-	-	23	6	29	29	100	1:3.8	70/60	12:90	40
8	-	18	5	14	19	37	51	2.8:1	110/30	12:55	35
9	15	-	7	30	37	52	71	1.4:1	80/20	11:80	50
10	26	66	27	15	42	108	39	1:3.5	60/70	16:70	60
TOTAL	-	-	149	345	494	4478	557	15.40:20.30	735/290	123.20:69600	422
MEAN			14.9	34.50	49.40	447.8	55.7	1:1.32	73.50/29.00	12.32:69.60	42.20

TABLE 11. Additional timber losses to be expected from spot growth over 30 days during summer on the Shoal Creek Ranger District

SPOT #	INFESTED TREES	BASAL AREA	PROBABILITY OF INACTIVITY (P)[2/]	PREDICTED ADDITIONAL TREES KILLED[3/]
1	4	70	.70	0
2	3	40	.72	0
3	6	80	.68	0
4	240	80	.00	109.72
5	82	145	.01	65.42
6	32	110	.26	14.70
7	29	130	.30	16.21
8	19	140	.46	9.49
9	37	100	.20	15.79
10	42	130	.15	26.45

2/ Hedden, op. cit.

3/ Billings, op. cit.

TABLE 12. Regional Nonlinear Rate of Growth Model[4/]

AT	DBH (cm)	TBA (M^2/ha)	POP (Spots/1000ha)	TK
49.4	31.29	22.67	.79	.31

[4/] Hedden, op. cit.

Table 13. Summary of Southern Pine Beetle Ground Check Data for the Tuskegee Ranger District, July 28-31, 1980.

SPOT NO.	VACATED TREES RED	VACATED TREES TOTAL	INFESTED TREES RED	INFESTED TREES GREEN	INFESTED TREES TOTAL	TOTAL TREES	% INF.	GREEN:RED	BASAL AREA PINE/HWD.	DBH:HT	AGE
1		245	41	48	89	334	27	1.17:1	160/-	10.5:52	44
2		49	4	1	5	54	9	1:4	50/-	14.5:80	58
3		11	2	0	2	13	15	0:2	70/-	11.5:45	39
4		13	1	0	1	14	7	0:1	40/-	13:75	42
5		18	0	1	1	19	5	1:0	100/-	14.5:71	42
6		38	1	1	2	40	5	1:1	-	-	60
TOTAL		374	49	51	100	474	68.00	4.17:9.00	420/-	64.00:	285
MEAN		62.33	8.17	8.50	16.67	79	11.33	1:2.14	84/-	12.80	47.50
Black Turpentine Spots											
		19	3	1	4	23	17	-	-	-	-
		17	2	0	2	19	11	-	-	-	-
		13	0	0	0	13	0	-	-	-	-
TOTAL		49	5	1	6	55	28	-	-	-	-
MEAN		16.33	1.67	.33	2	18.33	9.33	-	-	-	-

Table 14. Additional Timber Losses to be Expected from Spot Growth over 30 Days During Summer on the Tuskegee Ranger District

SPOT #	INFESTED TREES	BASAL AREA	PROBABILITY OF INACTIVITY(P)[2]	PREDICTED ADDITIONAL TREES KILLED[3]
1	89	160	.00	79.66
2	5	50	.69	0
3	2	70	.73	0
4	1	40	.75	0
5	1	100	.75	0

2/ Hedden, op. cit.

3/ Billings, op. cit.

TABLE 15. Regional Nonlinear Rate of Growth Model[4/]

AT	DBH (cm)	TBA (M^2/ha)	POP (Spots/1000ha)	TK
16.67	32.51	18.67	6.92	.28

[4/] Hedden, op. cit.

DISCUSSION SUMMARY

Low population levels of SPB are present on all the National Forest lands evaluated in this report. The spot growth projections presented in this report indicate that for the duration of FY 80 additional losses should be minimal. The infestation levels for FY 81 are difficult to predict due to the population dynamics of the overwintering infestation, the physiological state of the host trees and the rate of spot proliferation of the spring generations. However, the low population levels found in the existing spots will probably supply minimal brood for overwintering generations. Currently the hot dry weather has subjected the host trees to physiological stress. If these conditions continue throughout the fall and winter, the potential exists for successful spot proliferation during the spring of FY 81. Based on the current predictive technology, SPB infestations should remain at a low level, but the districts should be aware of potential spot growth and spot proliferation.

RECOMMENDATIONS

1. SPB suppression projects should be discontinued on all of the National Forests in Alabama.

2. Districts may wish to minimize endemic level loss through continued nonproject suppression. Appendix A outlines current FPM recommended techniques.

3. The current Alabama National Forest Control Plan should be reviewed and updated to incorporate new information presented in Appendix A. Pineville office personnel will cooperate with Forest personnel during the revision process.

4. Detection flights will be scheduled by Forest Pest Management on all districts during FY 81. A detection flight will be scheduled in June 1981 for the Bankhead, Shoal Creek, and Tuskegee Districts. Communications between the Forest and Forest Pest Management, Pineville Field Office, Pineville, Louisiana, 71360, (Telephone: FTS 497-7296, or commercial 318/473-7296) should continue to periodically evaluate any changes in SPB populations.

REFERENCES

Billings, R.F., B.G. Hynum. 1980. Southern Pine Beetle Guide for Predicting Timber Losses from Expanding Spots in East Texas, Circular 249. Texas Forest Service.

Billings, R.F. and H.A. Pase. 1979. A Field Guide for Ground Checking Southern Pine Beetle Spots. USDA Ag. Handbook 558. 19 pp.

Hedden, R.L. and D.D. Reed. Southern Pine Beetle: Factors Influencing the Growth and Decline of Summer Infestations (unpublished).

APPENDIX A

INTEGRATED PEST MANAGEMENT ALTERNATIVES

Preventive Techniques

While direct suppression projects have not been recommended for FY 81 it is possible to reduce further losses through preventive measures. The maintenance of vigorous stands has been shown to prevent SPB losses.

The following is a list of stand conditions that should reduce these losses:

1. Avoid basal areas in excess of 120 sq. ft/ac. Older, dense stands are low in vigor and are more likely to be attacked by SPB. They should be thinned as heavily as R-8 guides allow.

2. Make sure species is matched to site. Off-site plantations seldom achieve vigorous growth necessary to deter attacking beetles. Conversion of hardwood sites to pine also adds the additional stress of hardwood competition.

3. Note presence of littleleaf or annosus root rot sites. These sites have been shown to be problem SPB areas. Annosus root rot weakens trees predisposing them to beetle attack.

4. Plan for as little disturbance as possible when stands are thinned. Minimizing the damaging consequences associated with logging, pipeline, powerline, and other construction activities can significantly reduce the possibility of their leading to southern pine beetle problems.

5. Plan to minimize the impact of natural disturbances which cause stand stress. These factors include ice, wind, hail, animal damage, flooding, erosion, poor soil fertility, etc. Corrective measures include removal of individually damaged trees, wholesale salvage, improving drainage, etc.

6. Harvest mature and over mature stands. Such stands are vulnerable to beetle attack and should be harvested as soon as possible after rotation age is reached.

Direct Suppression Techniques

If ground checking and sale preparation are done at the same time, the estimated spot sizes from the aerial survey should be used to establish treatment priorities. However, if ground checking is done prior to sale preparation then the rating system in Table 16 should be used to determine

Table 16. Guide to southern pine beetle spot growth and control priorities (May through October)

Key to spot growth	Your spot's classification	Risk-rating points
A. Fresh attacks	absent	0
	present	30
B. Number of freshly attacked trees and those with developing brood	1-10	0
	11-20	10
	21-50	20
	more than 50	40
C. Pine basal area (or stand density) at active head(s) (ft^2/acre)	less than 80 (low density)	0
	80-120 (medium density)	10
	more than 120 (high density)	20
D. Average size class of timber (in inches)	pulpwood (9 in or less)	0
	sawtimber (more than 9 in)	10

If total is: 70-100 . . . . . .control priority is: High

If total is: 40-60 . . . . . .control priority is: Medium

If total is: 0-30 . . . . . .control priority is: Low

treatment priorities.

By utilizing this priority system all of the districts could efficiently and effectively apply control techniques to the few high and medium priority spots which account for the greatest percentage of the timber losses.

Suppression can be achieved using the following recommended techniques singularly or in combination.

1. Removal of Infested Trees by Commercial Sale or Administrative Use

When infested trees of merchantable size are accessible, they should be removed by commercial sale or administrative use procedures. Logging of the infested material should begin immediately. Contract time limits should insure rapid removal.

When practical, and if host type is present, a 40- to 70-foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. A 100-ft. strip (and occasionally larger) may be needed for large, rapidly expanding spots. As a rule, the width of the buffer should not exceed the average height of the trees in the spot. This practice is effective in reducing the possibility of "breakouts." When a spot has 10 or fewer infested trees, none of which are freshly attacked, it normally should not be treated.

Salvage removal of infested and buffer-strip trees should be as soon as possible after marking the spot. SPB Suppression Project funds should be used only for salvage of infested and buffer-strip trees. Vacated trees without beetles can be left standing since their removal will not contribute to beetle control. However, they can be salvaged if they have not deteriorated and the additional volume is needed to make the salvage removal economically feasible. Wood products can often be produced from beetle-attacked trees 6 mo. - 1 yr. after the trees have been killed.

The order of priority for removing beetle infested timber from a spot should be as follows:

May - October

--Trees in the buffer zone at the head(s) of the spot - if not removed within 2 weeks of marking, another visit and tally must be made in order to insure removal of all infested trees and an adequate buffer strip.

--Trees with fresh attacks and having young brood (usually the green, recently infested trees).

--Trees having nearly developed brood (usually the red and fading trees).

November - April

--Remaining trees with living brood

--Trees with fresh attacks

--Trees in the buffer zone.

2. Piling and Burning

Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly burning the bark of infested trees. The entire bark surface must be thoroughly burned to insure effective control. The side order of priority for cutting, piling, and burning infested trees, particularly the large spots, is the same as paragraph 1 under "Removal of Infested Trees by Commercial Sale or Administrative Use." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts," every effort should be made to locate and treat all green infested trees during the piling and burning operation.

3. Chemical Control

Infested trees are felled toward the center of the spot. They are then cut, limbed, and bucked into workable lengths. The infested bark surface is sprayed to the point of runoff with lindane or Dursban® 4E. A compressed air sprayer (3-gallon capacity or equivalent) is an ideal applicator. Infested logs must be turned two or three times to insure complete treatment of infested bark. Vehicle mounted low pressure sprayers may be used to treat larger accessible infestations.

The order of priority for cutting and spraying infested trees in large spots is the same as paragraph 1 under "Removal of Infested Trees by Commercial Sale or Administrative Use." Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts, every effort should be made to locate and treat all green infested trees during the chemical control operation.

Never spray trees from which southern pine beetle brood has emerged. Natural enemies of the southern pine beetle in these trees can then complete their development.

Instructions for minimizing the adverse effects of mixing, transporting and storing pesticides, applying pesticides, and disposing of pesticide containers and excess chemicals are outlined in Section 8.3 of the Forest Service Health and Safety Code FSM 5242.21. Forest Pest Management, Pineville, LA should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures.

4. Cut-and-leave

This control tactic has reduced losses from spot growth and proliferation during the summer (May 1-September 30). Cut-and-leave is designed to disrupt spot growth in small to medium-sized spots (50 active trees) by causing emerging beetles to disperse at a time of year when this behavior is unnatural. These spots can be salvaged when markets or weather permit. Trees are still suitable for sale months after felling.

The following procedure is to be used when the cut-and-leave alternative is selected:

(1) Identify all active spots with 10 to 50 infested trees within the spot.

(2) Fell all active trees toward the center of the spot.

(3) Fell a horseshoe-shaped buffer of green, uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be as wide as the average height of the trees in the stand. In small spots, the buffer may encircle the spot.

Spots with 10 or more infested trees should be treated first. As time permits, spots with 10 infested trees should also be treated if they contain trees with recent, fresh attacks. In these smaller infestations where a specific head is not distinguishable, an adequate buffer strip (equivalent to the average height of the stand) and all infested and green uninfested trees within the spot should be felled.

Reexamination of Treated Areas

Reexamine areas where infested trees were removed by commercial sales, piled and burned, chemically treated, or cut and left, within 2 or 3 weeks after treatment to check for additional infested trees. If additional trees are found, treat them.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants.

Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops,

and beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or state extension specialist to be sure the intended use is still registered.